JOURNAL OF MICROBIOLOGY & BIOLOGY EDUCATION
DOI: https://doi.org/10.1128/jmbe.v19i1.1417

Science Communication

# Introducing Students to the Challenges of Communicating Science by Using a Tool That Employs Only the 1,000 Most Commonly Used Words †

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**Overcoming the complex and technical language used in science is a major barrier to scientists being able to communicate their work with the general public. This can lead to misunderstanding and mistrust of science, with many negative consequences. Scientists are increasingly seeking to improve their ability to communicate their work effectively with a variety of audiences. As such, students should recognize the challenges and importance of communicating science with nonscientists. This short classroom activity takes advantage of a free, web-based tool, called Simple Writer (https://xkcd.com/simplewriter/), which facilitates the writing and revising of text using only the 1,000 most commonly used words in English. Students are asked to write a paragraph in response to a prompt and use the Simple Writer tool to convert it into a form using only the 1,000 most commonly used words, while still maintaining the same message. By experiencing the difficulty of converting a relatively simple paragraph to meet to this criteria, students gain an appreciation for the challenge of removing jargon from scientific and other technical writing. Beyond the initial activity, the Simple Writer platform can be used in various other ways to engage students in learning science and developing essential writing skills.**

## INTRODUCTION

With the increased emphasis on scientists being able to effectively communicate their work with nonscientists (1, 2), it is important for students to appreciate the challenges of such communication, and to begin to develop their skills toward that goal (3–5). This article presents a short activity that uses a free web-based tool, called Simple Writer, to introduce students to the challenges and importance of clear science communication.

As author of the web comic xkcd (https://xkcd.com/), Randall Munroe is well-versed in communicating scientific and mathematical topics in creative ways (6, 7). In 2012, he published a comic called "Up Goer Five" in which he used only the 1,000 most commonly used words (and derivatives) to label and describe a drawing of NASA's Saturn V rocket (https://xkcd.com/1133/). The positive response to this comic, and his enjoyment of the process, led him to use the same premise to describe many other scientific concepts and everyday objects in his book *Thing Explainer: Complicated Stuff in Simple Words* (7). Munroe published the tool he created to accomplish this feat, called Simple Writer (https://xkcd.com/simplewriter), which enables anyone to write their own explanations using the same criteria. As you simply type or paste words into a text box, the tool highlights and lists the terms that are not found in his list of 1,000 most commonly used words (for criteria and full list, see *Thing Explainer* [7]). Simple Writer can help turn complex or technical writing into a form of simpler language, which can in turn help students gain an appreciation for the challenges of science communication. Simple Writer joins other creative formats, such as podcasts, TED talks, elevator pitches, and interpretive dances as ways to close the gap between scientists and the public. There is already a Tumblr feed (http://tenhundredwordsofscience.tumblr.com/) and research conference sessions (http://www.abstractsonline.com/pp8/#!/4358/session/660) dedicated to scientists explaining their work using only the 1,000 most common words, highlighting the applications and power of this approach to communicating and learning science.

## PROCEDURE

This activity is suitable for any high school or undergraduate course in which the nature of science or science communication is emphasized. It requires no background content knowledge. It works best as an in-class activity (one 50-minute period), but students must have access to the Internet, preferably on devices with full keyboards to better facilitate typing. The activity can be completed outside of class for homework, followed by an in-class discussion of

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Received: 6 August 2017, Accepted: 27 November 2017, Published: 30 March 2018.
†Supplemental materials available at http://asmscience.org/jmbe

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the results, but this will provide less support for students and would make the task more difficult.

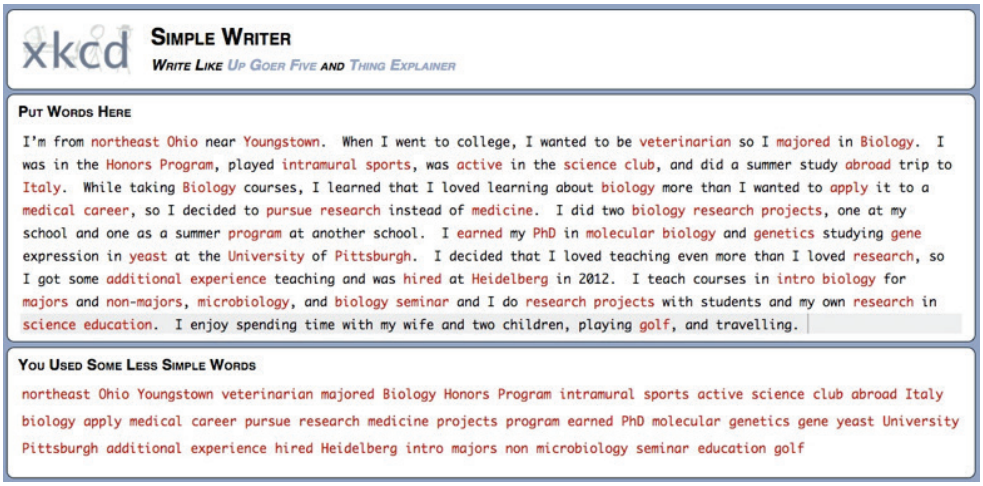
Students are given a prompt to type an introductory paragraph about themselves (see Appendix 1 for the full worksheet). Ideally, they should not be aware of the Simple Writer task before they write their paragraph, as it may bias their word choice. The activity can be introduced with any writing prompt, but this one was chosen because students can generate it relatively easily without inducing much stress, and it can make for a good icebreaker activity near the beginning of a course.

After completing Part 1 of the worksheet (~10 minutes), the Simple Writer tool is introduced using an example developed by the instructor that parallels student responses (~5 minutes) (Fig. 1). This example is likely to be longer than the ones generated by students, but showing an example helps them understand the task and reduces potential frustration with the activity. Instructors can generate their own personalized examples for their classes. Students complete Parts 2 and 3, in which they must rework their paragraphs to contain only the 1,000 most commonly used words while still maintaining the same message, and then reflect on the experience (~15 minutes). A few volunteers are solicited to share their initial and reworked paragraph as examples (~10 minutes). The exercise closes with a class discussion, based on student responses to Part 3, about the activity and how it relates to science communication (~10 minutes).

## CONCLUSION

This quick activity prompts discussion of the challenges and importance of science communication. While students find the task very difficult, even frustrating at times, they generally enjoy the challenge and the reward of finding suitable alternative phrases. The sharing of some of the before and after paragraphs with the class is often very entertaining, and students enjoy seeing the creative,

A




B

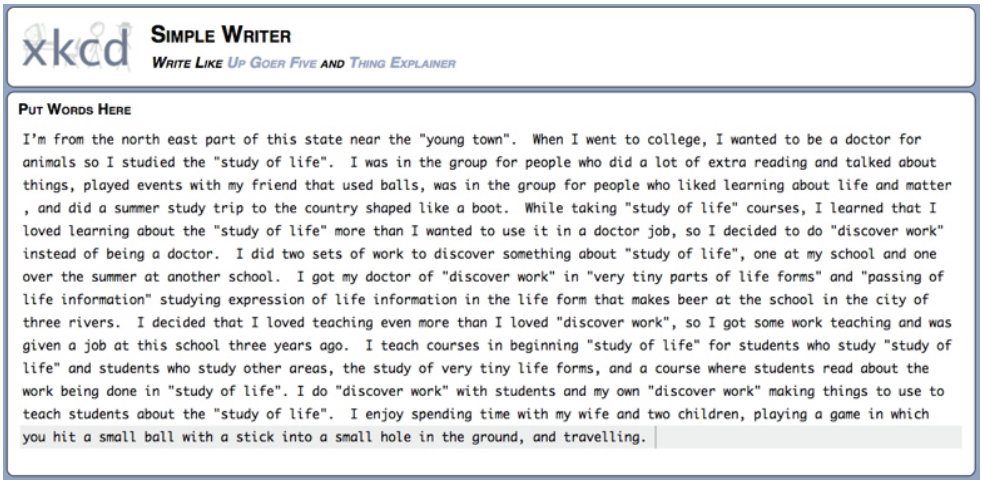



FIGURE 1. A) Screenshot of the Simple Writer tool (https://xkcd.com/simplewriter/) in which a sample response (from the instructor) to the writing prompt is pasted into in the box labeled "Put Words Here." Words not found among the 1,000 most commonly used words are highlighted in red and show up in the box below labeled "You Used Some Less Simple Words." B) Screenshot of the text after it was edited to remove the highlighted words while trying to maintain the same message.

and often humorous, word and phrase substitutions chosen by their peers. Importantly, students easily recognize the difficulty of replacing certain words, especially proper nouns, and are often surprised by which terms are—or are not—included in the list. Their paragraphs usually get longer, as they need more words to express the same idea, and they are generally much more difficult to interpret. Because of the way their message, which was relatively basic to begin with, becomes distorted, they appreciate how much a scientist's work might get twisted and oversimplified in attempts to help people understand it.

As with any model, there are limitations, so it can also be useful to discuss how this activity *does not* mirror science communication. For example, scientists do not have the restriction of removing all technical terms or complex language from their communications and, as students can see in the exercise, simply removing all jargon does not necessarily make a message clearer. The goal, therefore, is to make sure key terms and concepts are carefully defined and explained, at a level appropriate to the audience, rather than not used at all (8).

While this introductory activity does not include communication of any actual science, once students are familiar with the concept behind Simple Writer, many possible extension activities can bring in science content, and help students delve further into the concept and improve their skills. Munroe's *Thing Explainer* includes a diagram and description of cells ("Tiny Bags of Water You're Made of") that can be used in a matching activity for learning parts of the cell (Table 1) (7). Other *Thing Explainer* topics can connect the activity to other disciplines, such as Chemistry (periodic table = "The Pieces Everything is Made of"), Geology (tectonic plates = "Big Flat Rocks We Live On"), or Anatomy (human organs = "Bags of Stuff Inside You") (7). Students can use Simple Writer to rewrite small sections of text or re-label images/graphs from their textbook or other key readings such as journal articles. They can also be challenged to write their own Simple Writer terms and descriptions for other course topics, thus creating interesting and useful study tools for the class. There is extensive potential to use the Simple Writer platform to help students explore creative ways to engage with complex scientific vocabulary and topics.

## SUPPLEMENTAL MATERIALS

Appendix 1: Activity worksheet

TABLE 1.
A sample extension activity using Randall Munroe's Thing Explainer.

**Parts of the Cell (Tiny Bags of Water You're Made of) Activity**
**Match the term on the left with the "more simple" term and description on the right.**

| Biological Term | Thing Explainer Term and Description |
|---|---|
| 1. Cell Membrane/Cell Wall | A. *Little Animals* – These are living things (not really "animals") that got stuck in our bags of water a long time ago, like the green things in tree leaves. Now we can't live without each other. They get food and air from our bodies and turn them into power for our bags. |
| 2. Cytoskeleton | B. *Outside Wall* – The water bags that make up animals have soft walls. The bags in trees and flowers, which don't need to move around as much as us, have a less soft outside layer. |
| 3. Golgi Apparatus | C. *Control Area* – This area in the middle holds information about how to make the different parts of your body. It writes this information in notes and sends them out into the bag. |
| 4. Lysosomes | D. *Machine Maker* – This part (of the control area) makes the little (building) machines that sit outside of the control area. |
| 5. Mitochondria | E. *Little Builders* – Little building machines that build new parts for the bag. The builders sit just outside the control area, reading the notes from inside that tell them what to build. |
| 6. Nucleolus | F. *Bag Shapers* – The space between bag parts is full of lots of very thin hair-like lines. These are like bones for the bag; they help hold its shape. Some of these shapers also have holes down the middle, and can carry things from one part of the bag to another. |
| 7. Nucleus | G. *Bags of Death Water* – These little bags are full of a kind of water that breaks things into tiny pieces. If something is put inside them, the water breaks it down into whatever it's made of. |
| 8. Ribosomes | H. *Bag Filler* – This machine fill little bags with stuff and then sends them out into the water. Some stuff gets sent out of the big bag to another part of your body. The machine also fills bags with death water, marking them very carefully before sending them out so they don't get used in the wrong place. |

The task has students matching terms related to the parts of the cell with Munroe's terms and definitions written using only the 1,000 most commonly used words (7).

## ACKNOWLEDGMENTS

The author is not affiliated with Randall Munroe, xkcd comics, or Houghton Mifflin Harcourt Publishing and declares no conflict of interest. The author is grateful to the students who field-tested the activity and Enya Granados for providing valuable feedback on the activity and manuscript.

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